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Sub: Probability & Statistics.

Final Term Assignment

Question No 1:

Sol:

(i) (A) least square regression equation

$$\bar{y} = a + bx$$

$$a = \bar{y} - b\bar{x}$$

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

x	y	xy	x^2	y^2
53	20	1060	2809	400
62	32	1984	3844	1024
57	45	2565	3249	2025
71	60	4260	5041	2600
78	80	6240	6084	6400
95	100	9500	9025	10000
86	120	10320	7396	14400
87	140	12180	7569	19600
96	160	15360	9216	25600
91	180	16380	8281	32400
94	200	18800	8336	40000
94	210	19740	8836	44100
$\Sigma x = 964$	$\Sigma y = 1347$	$\Sigma xy = 118389$	$\Sigma x^2 = 79686$	$\Sigma y^2 = 199549$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{964}{12} = 80.33$$

$$\bar{y} = \frac{\Sigma y}{n} = \frac{1347}{12} = 112.25$$

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{12(118389) - (964)(1347)}{12(79686) - (964)^2}$$

$$= \frac{1420668 - 1298508}{956232 - 929296}$$

$$= \frac{122160}{26936}$$

$$b = 4.53$$

$$a = \bar{y} - b\bar{x}$$

$$a = 112.25 - 4.53(80.33)$$

$$a = 251.6449$$

$$\bar{y} = a + bx$$

$$\bar{y} = 251.6449 + 4.53x$$

Regression line equation.

(B) Co-efficient correlation y on x

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\sqrt{n\Sigma y^2 - (\Sigma y)^2}}$$

$$r = \frac{12(118389) - (964)(1347)}{\sqrt{12(79686) - (964)^2}\sqrt{12(199549) - (1347)^2}}$$

$$r = \frac{1420668 - 1298808}{\sqrt{956232 - (929296)}\sqrt{2394588 - 1814409}}$$

$$= \frac{122160}{\sqrt{956232 - 222528105048 - 1814409}}$$

$$= \frac{122160}{\sqrt{956232 - 222526290639}}$$

$$= \frac{122160}{\sqrt{222525334407}}$$

$$= \frac{122460}{471725.9}$$

$$\gamma = 0.25$$

Question No (2):

PART (A):

Sol:

$$n(S) = \binom{13}{3} = 286$$

4 - R
4 - W
5 - G
13 - Balls

Let

A = Denote all balls are of different colours.

$$n(A) = \binom{4}{1}\binom{4}{1}\binom{5}{1} = 4 \times 4 \times 5 = 80$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{80}{286} = 0.28.$$

$2 \times 2 \times 2 = 8$

even × even × even = even

$3 \times 2 \times 2 = 12$

odd × even × even = even

$3 \times 3 \times 2 = 18$

odd × odd × even = even

INTERPRETATION:

There are 28% chances that all balls are different colours.

(ii) Let B = Denote all balls of same colour.

Red white Green

$$n(B) = \binom{4}{3} \text{ or } \binom{4}{3} \text{ or } \binom{5}{3}$$

$= \binom{4}{3} + \binom{4}{3} + \binom{5}{3} = 4 + 4 + 10 = 18$

$P(B) = n(B) / n(S) = 18 / 286 = 0.063$

INTERPRETATION:

There are 6.3% chances that all balls of same colours.

Question No (2):

PART (B):

$$n(S) = \binom{12}{4} = 495$$

2-B
10-G
12-Eggs.

(i) Let = A = denote the event that exactly one egg is bad.

$$n(A) = \binom{2}{1}\binom{10}{3} = 2 \times 120 = 240$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{240}{495} = 0.48$$

INTERPRETATION:

There are 48% chances that exactly one egg is bad

(ii) Let B = be the event that at least one bad egg is selected.

$$n(B) = \binom{2}{1}\binom{10}{3} + \binom{2}{2}\binom{10}{2}$$

$$= 2 \times 120 + 1 \times 45 = 240 + 45 = 285$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{285}{495} = 0.58$$

INTERPRETATION:

There are 58% chances that at least one bad egg is selected.

Question No (3):

Sol:

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
95	95	95
199	37	74
36	48	52
84	13	13
29	3	4

$$\text{Range} = X_m - X_0$$

$$\text{Range of } A = X_m - X_0$$
$$= 199 - 6$$
$$= 193$$

$$\text{Range of } B = X_m - X_0$$
$$= 95 - 3$$
$$= 92$$

Range of $C = X_m - X_0$

$= 95 - 4$

$= 91$

Batsman A		Batsman B		Batsman C	
X	X^2	Y	Y^2	Z	Z^2
12	144	47	2209	15	225
15	225	12	144	23	529
6	36	76	5776	52	2704
73	5329	48	2304	4	16
7	49	4	16	24	576
95	9025	95	9025	95	9025
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 556$	$\Sigma x^2 = 63602$	$\Sigma y = 410$	$\Sigma y^2 = 23325$	$\Sigma z = 356$	$\Sigma z^2 = 21,440$

→ Batsman A

$\bar{x} = \Sigma x / n \quad \because n = 10$

$\bar{x} = 556/10 = 55.6$

$\sigma x = \sqrt{\Sigma x^2/n - (\Sigma x/n)^2}$

$= 63602/10 - 556/10$

$\sigma \bar{x} = 79.40$

$C.V = 79.40 \times 100 / \bar{x} = 79.40/55.6$

$= 1.42 \times 100$

$C.V = 142$

→ BATSMAN B :

$y = \Sigma y / n = 410/10 = 41$

$\sigma y = \sqrt{\Sigma y^2/n - (\Sigma y/n)^2}$

$$= \sqrt{\frac{23325}{10} - \left(\frac{410}{10}\right)^2}$$

~~$= \sqrt{2332.5 - 1681 \quad (41)^2}$~~

~~$= 2291.5$~~ $= \sqrt{2332.5 - 1681}$

$= \sqrt{651.5} = 25.52$

$$C.V = \frac{25.52}{41} \times 100$$

$= 62.24\%$

BATMAN C:

$$\Sigma x/n = 356/10 = 35.6$$

$$\sigma x = \sqrt{\Sigma x^2/n - \left(\Sigma x/n\right)^2}$$

$$= \sqrt{21440/10 - \left(356/10\right)^2}$$

$$= \sqrt{2144 - 1267.36}$$

$$= \sqrt{876.64}$$

$= 29.60$

$C.V = \sigma x / \bar{x}$

$= 29.60 / 35.6 \times 100$

$= 83.14\%$

Batsman B is more consistant as it value of co-efficient of variance is smallest

Compare A with B

B is consistant

Compare B with A

B is more consistant

Compare A with C

C is more consistant